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FLOOD INSURANCE STUDY

OSCEOLA COUNTY, FLORIDA
UNINCORPORATED AREAS

MARCH 16, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER 120189

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 9.0.

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Flood Insurance Rate Map

FLOOD INSURANCE STUDY
UNINCORPORATED AREAS OF OSCEOLA COUNTY, FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the unincorporated areas of Osceola County, Florida, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Osceola County to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Coordination

City and county officials; the U.S. Department of Agriculture (USDA); Soil Conservation Service (SCS); the U.S. Geological Survey (USGS); the U.S. Weather Bureau; the East Central Florida Regional Planning Council; and local residents were contacted during the course of this study. Available maps, flood data, rainfall data, and technical publications were obtained.

A precontract consultation and coordination meeting to explain the nature and purpose of a Flood Insurance Study, to give a detailed presentation of Flood Insurance Study procedures, and to discuss the areas in Osceola County which would be included in the Flood Insurance Study was held in Kissimmee, Florida, on February 23, 1978. Representatives from the U.S. Army Corps of Engineers (COE), FEMA, and local officials and residents of Osceola County attended.

A meeting to discuss the results of the hydrologic studies was held in Kissimmee on March 12, 1980. Representatives from the COE, FEMA, and county officials attended.

On March 2, 1981, the results of the study were reviewed at a final coordination meeting attended by representatives of the COE, FEMA, and officials of Osceola County.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, Jacksonville District, for the Federal Emergency Management Agency, under Interagency Agreement No. IAA-H-1878, Project Order No. 10, and Amendment No. 1. This study was completed in January 1980 and covered all significant flooding sources in Osceola County.

2.0 AREA STUDIED

2.1 Scope of Study

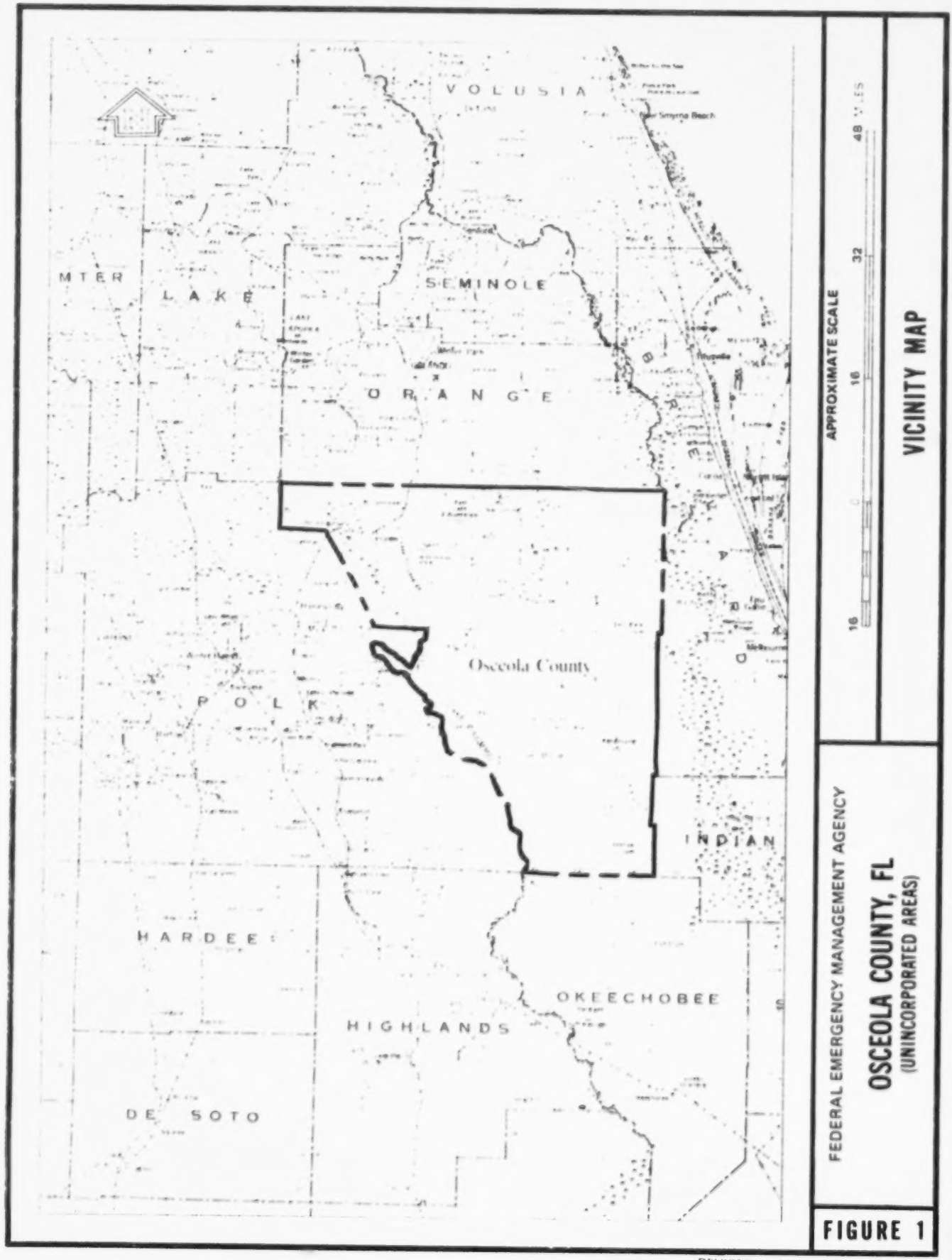
This Flood Insurance Study covers the unincorporated areas of Osceola County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

The detail study area determined and agreed upon at the precontract consultation and coordination meeting on December 14, 1977, included 9 streams and 22 lakes. However, in August 1979, the COE and FEMA agreed to limit the detail study area to five streams and ten lakes as shown in Table 1. The detail study area was reduced because the COE is currently conducting a survey-review study of the Kissimmee River Basin, Florida. Upon completion of the survey-review hydrology and hydraulic studies, the streams and lakes included in the survey-review study can be incorporated into the Osceola County Flood Insurance Rate Maps as detail studies with 100-year flood elevations and flood hazard factors provided. The survey review study is scheduled for completion in late 1982. The streams and lakes to be studied in the survey-review study are shown in Table 2.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through 1985.

TABLE 1 - FLOOD INSURANCE DETAIL STUDY AREAS

Streams	Lakes
Reedy Creek	Brown
Mill Slough	Buck
Boggy Creek	Cecile
Shingle Creek	Davenport
St. Cloud Canal	East Lake Tohopekaliga



REVISED 3/16/89

TABLE 1 - FLOOD INSURANCE DETAIL STUDY AREAS - cont.

Streams	Lakes
(No additional streams)	Runnymede
	Russell
	Tohopekaliga
	Wilson
	Mary Jane

TABLE 2 - SURVEY REVIEW STUDY AREAS

Streams	Lakes
Kissimmee River	Kissimmee
Jackson Canal	Hatchineha
Fodderstack Slough	Cypress
Scrub Slough	Jackson
Hatchineha Canal	Brick
Kissimmee-Cypress Canal	Pearl
Gentry-Cypress Canal	Buck
Low Log Canal	Conlin
East Lake Tohopekaliga Canals	Joel
Jim Branch	Bullock
Gator Bay Branch	Myrtle
Davenport Creek	Preston
Partin Canal	Tohopekaliga
Lake Tohopekaliga Canals	East Lake Tohopekaliga
Alligator-Gentry Canal	Fish
St. Cloud Canal	Ajay
	Hinden
	Center
	Coon
	Trout
	Lizzie
	Alligator
	Bay
	Live Oak
	Sardine
	Gentry
	Marian

2.2 Community Description

Osceola County is located in central Florida and had a 1970 census population of 25,267 (Reference 1), an increase of 32.8 percent from the 1960 population of 19,029. It has been reported that the 1979 population of Osceola County was about 46,800. Osceola County was established May 12, 1887, as the fortieth county in Florida. It was named for Osceola, Chief of the Seminoles. Osceola is one of Florida's largest counties with an approximate land area of 1,310 square miles.

The flood plains of Osceola County consist of lowlands adjacent to the streams and lakes. The topography of Osceola County is relatively flat with some gently rolling hills. Ground elevations in Osceola County range from less than 5 feet above National Geodetic Vertical Datum of 1929 (NGVD) to 190 feet, NGVD.

The climate of Osceola County is semitropical, characterized by warm, humid summers and mild, dry winters. Daily maximum temperatures average 90 degrees F in the summer and average daily minimums are around 50 degrees F in the winter. Temperature extremes of over 100 degrees F or under 20 degrees F are rare.

The mean annual temperature is about 72 degrees F. The average annual precipitation over the study area is about 52 inches, and approximately 72 percent occurs in the May - October rainy season.

The soils in Osceola County consist of 11 soil associations. Three of these are either moderately well drained or excessively drained. The rest are soils that vary between poorly drained to very poorly drained (Reference 2).

Agriculture is important in Osceola County. Vegetable crops, citrus groves, and cattle are raised throughout the county. Much of the woodland is in poor condition and is used mainly for range (Reference 2).

2.3 Principal Flood Problems

Floods can occur in Osceola County any time during the year; however, they are most frequent during the June - October rainy season. Floods on the lakes would result from prolonged heavy rainfall over the study area with high antecedent lake stages. Floods on the streams would result from prolonged heavy rainfall over a large area. The flooding would be more severe from rainfall associated with hurricanes or tropical storms and when antecedent rainfall has resulted in saturated ground conditions when the infiltration is minimal. Cloudburst storms can occur any time but do not constitute a serious flood hazard in the study area.

Since Osceola County was practically uninhabited before the 1900's, flood records are scarce. The flood history, however, has been quite similar to that of adjacent upper St. Johns River Basin where records show that floods much greater than any of recent record occurred in 1871 and 1898 and that the floods of 1910, 1913, 1924, and 1933 were probably comparable with major occurrences of more recent date. In recent years, floods causing significant damage in Osceola County occurred in 1945, 1947, 1948, 1949, 1953, 1956, 1958, 1960, and 1968. Among these, the 1953 and 1960 floods were the highest of record.

The stages produced by the 1953 flood are generally the most severe of floods on record. The flood producing rainfall was one of the heaviest ever recorded in the study area, approximately 47 inches from June through October. Damages were severe throughout the study area and especially large for the cattle and food crop industries.

The flood of 1960 occurred when above normal seasonal rainfall coincided with the heavy rains of Hurricane Donna and tropical storm Florence in September. Discharge on the Kissimmee River below Lake Kissimmee peaked at 6,830 cfs on 30 September. This was near the maximum recorded discharge of 8,820 cfs which occurred in 1948.

2.4 Flood Protection Measures

The COE has constructed numerous flood protection measures in Osceola County. Regulation of the Kissimmee Lakes took place over a 6-year period from 1964 to 1970. It began with East Lake Tohopekaliga and proceeded down the west chain of lakes to Lake Kissimmee. Regulation of the west chain of lakes through Lake Kissimmee was essentially complete by 1965. Work then proceeded up the east chain of lakes reaching Lake Alligator by 1967. The portion of the east chain of lakes from Alligator to East Tohopekaliga regulation was accomplished from September 1967 to May 1970. Between 1964 and 1970 interim regulation schedules were adopted as soon as lake outlet works were completed. It was intended to implement permanent schedules upon completion of all works including Kissimmee River (C-38). However, even though numerous efforts were made, unanimity could not be reached between all concerns and each effort usually ended by recommending or awaiting the results of additional studies. In 1975, after a comprehensive hydrologic study of the Kissimmee Basin and two public meetings, the Central and Southern Florida Flood Control District prepared a report entitled "Report to the Governing Board on Regulatory Levels for Lakes in the Upper Kissimmee Basin." The schedules were approved by the COE and adopted on February 9, 1976. Because of the possibility of further revision to Kissimmee Lakes regulation, the 1976 schedules have been adopted as interim schedules.

East Lake Tohopekaliga and a small tributary lake named Ajay are regulated by S-59, located in the St. Cloud Canal (C-31) between East Lake Tohopekaliga and Lake Tohopekaliga. Regulation did not begin until 1964, although construction of S-59 and C-31 was completed in April 1963. This was principally because regulation was contingent upon Lake Tohopekaliga outlet works which were not completed until late 1963. The original regulation schedule was modified in 1967 and was used until 1976, when the existing schedule was introduced. The levels are regulated between 54.5 to 58.0 feet NGVD.

Lake Tohopekaliga is regulated by S-61, located in Southport Canal (C-35) at the south shore of the lake. Construction of S-61 and C-35 was completed in October 1963 and regulation of Lake Tohopekaliga began in early 1964. In 1971 and again in 1979 the regulation schedules for Lake Tohopekaliga, East Tohopekaliga, Kissimmee, Cypress, and Hatchineha were modified for implementation of the draw down of water levels in Lake Tohopekaliga. The drawdowns were conducted in cooperation with the Florida Game and Fresh Water Fish Commission (FG&FWFC) for enhancement of fish habitat in the lake. The levels are regulated between 51.5 to 55.0 feet NGVD.

Lakes Kissimmee, Hatchineha, and Cypress are regulated by a single structure, S-65, located at the outlet of Lake Kissimmee at the head of C-38. The orginal General Design Memorandum plan called for Lakes Hatchineha and Cypress to be regulated together, but independently of Lake Kissimmee by a structure in the canal connecting Lakes Hatchineha and Kissimmee. Levels of Hatchineha and Cypress were to be 1-foot higher than those for Lake Kissimmee. However, it was determined feasible to combine the regulation whereby the Kissimmee schedule would be raised 0.5 foot and Hatchineha and Cypress would be lowered 0.5 foot. Regulation began after the completion of S-65 in August 1964. The levels are regulated between 48.5 to 52.5 feet NGVD.

Lake Gentry is regulated by S-63 located in C-34 at the south end of the lake. Water levels in C-34, downstream of S-63, are further stepped down by S-63A before it discharges into Lake Cypress. Regulation began in May 1967 with completion of S-63, S-63A, and C-34. The levels are regulated between 59.0 to 61.5 feet NGVD.

Lakes Alligator, Center, Coon, Trout, Lizzie, and Brick are controlled by two structures, S-58 located in C-32 which connects Lakes Trout and Joel, and S-60 located in C-33 between Lakes Alligator and Gentry. The southern outlet S-60 and C-33 were completed in December 1966, thereby providing some regulatory control. However, it was not until the northern outlet (S-58) was completed in October 1969 that full control was possible. The levels are regulated between 61.5 to 64.0 feet NGVD.

Lakes Joel, Myrtle, and Preston are regulated by a single structure, S-57 located in C-30 connecting Lakes Myrtle and Mary Jane. Regulation began in September 1969 upon completion of S-57 and C-30. The levels are regulated between 59.5 to 62.0 feet NGVD.

Lakes Hart and Mary Jane are regulated by a single structure, S-62 located in C-29 which discharges into Lake Ajay. Regulation began in May 1970 after completion of S-62 and C-29 in October 1969. The levels are regulated between 59.5 to 61.0 feet NGVD.

The South Florida Water Management District (SFWMD) has proposed a management plan for the Shingle Creek basin. The plan is the result of the combined efforts of the SFWMD, the cities of Orlando and Kissimmee, and the counties of Orange and Osceola. The key elements of the plan are:

1. A flood plain management program through zoning or other appropriate means.

2. A capital improvement program which provides for the following structural improvements to alleviate existing flooding problems:

a. Excavation of the channel north of the turnpike in Orange County to provide greater runoff relief during the 100-year flood.

b. Improvements to bridges at McLeod Road, Orlando-Vineland Road, Interstate 4, and Americana Boulevard in Orange County and State Highways 600 and 531 in Osceola County.

c. Installation of a 2,700 cfs water control structure south of Oak Ridge Road in Orange County to prevent overdrainage and control erosion.

d. Creation of a floodway bypass of Shingle Creek between Old Tampa Highway and U.S. 17-92, in Osceola County, in order to reduce flood stages during major storm events and specifically the 100-year flood in the lower reaches.

The COE has an authorized flood control project on Boggy Creek (Reference 3). However, construction has not begun and is not anticipated to begin in the near future.

There are no existing or other proposed flood protection projects in Osceola County and the surrounding area which would alleviate or significantly reduce the 100-year flood levels in Osceola County.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood

which equals or exceeds to 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

No long-term stream gages are located on the five streams studied in detail in Osceola County. The hydrologic data for Boggy Creek (Reference 4), Shingle Creek (Reference 5), Reedy Creek (Reference 6), Mill Slough (Reference 7), and the St. Cloud Canal (Reference 8) were obtained from previous studies.

The peak discharge-drainage area relationships for the selected recurrence intervals are presented in Table 3, "Summary of Discharges."

TABLE 3 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
REEDY CREEK:					
US 92 Bridge	209.0	800	1,100	1,100	1,100
Lake Russell	264.0	2,700	4,000	4,500	5,100
Cypress Lake	282.0	3,300	5,000	5,700	6,350
MILL SLOUGH:					
At US 441 (Vine St.)	11.6	710	1,040	1,360	2,050
At Mill Slough Road	10.7	660	970	1,300	1,900
BOGGY CREEK:					
At Swamp Outflow	55.7	3,000	5,090	6,310	8,920
SHINGLE CREEK:					
At SR 530	49.2	2,030	4,770	6,420	12,030
At mouth	69.8	3,420	5,940	7,950	15,130

Rainfall-frequency estimates were obtained by statistical analysis of records from eight long-term rainfall stations in and near Orange and Seminole Counties, Florida (Reference 9). Results of the rainfall study are summarized below.

Duration	Rainfall - Inches			
	10-Year	50-Year	100-Year	500-Year
24 hours	6.6	9.7	11.3	16.4
2 days	7.1	10.0	11.7	16.8
3 days	7.7	10.6	12.3	17.3
4 days	8.2	11.2	12.9	17.8
5 days	8.7	11.8	13.5	18.3
7 days	9.6	12.9	14.1	19.3
30 days	18.2	23.0	25.1	28.4

The amount of rainfall that will run off (rainfall excess) from a particular basin is less than the rainfall due to soil permeability, vegetation cover, and other characteristics. To estimate the rainfall excess, the SCS has developed Runoff Curve Numbers (Reference 10) which relate rainfall to direct runoff. The Runoff Curve Numbers were used to calculate the infiltration losses based on the soil type and land use.

The volumetric-runoff method was used to analyze Lakes Brown, Buck, Cecile, Davenport, Runnymede, and Wilson. This method involved analyzing several storms with respect to the various lake basins to determine the percent of rainfall that can be expected to run off the land area into the lakes, determining the rainfall recess, and determining the infiltration losses (Reference 10). The next step involved applying the 5-day rainfall (Reference 9), calculating the volume of rain falling directly on the lake by multiplying the rainfall depth by the lake area, and calculating the volume of rainfall runoff from the land area into the lake by determining the rainfall excess. The sum of the volume of rain falling on the lake and the volume of rain running off the land gives the total volume of rainfall the lake will receive during the particular storm. Area-capacity curves were developed for the lakes. The computed rainfall volumes were applied to the area-capacity curves revealing lake stage and inundated area for each particular storm. The results of the hydrologic analyses for the lakes studied by the volumetric-runoff method are shown in Table 4, "Summary of Elevations."

Elevations for floods of the selected recurrence intervals on Lake Russell are shown in Table 4. The elevations were determined from the hydrologic analyses for Reedy Creek (Reference 6).

Elevations for floods of the selected recurrence intervals on Lake Tohopekaliga, East Lake Tohopekaliga and St. Cloud Canal are shown in Table 4. The elevations were determined fom flood routings conducted by the Jacksonville District COE in conjunction with the flood control project (Reference 8). Elevations in Lake Runnymede are controlled by East LakeTohopekaliga. Elevations in the St. Cloud Canal are controlled by Lake Tohopekaliga. In addition, there are flooding effects from Lake Mary Jane and West City Canal present in the county.

TABLE 4 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION ABOVE NGVD (feet) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
Brown Lake	64.1	64.7	65.0	65.8
Buck Lake	103.6	104.2	104.5	105.2
Lake Cecile	76.3	76.8	77.1	77.9
Lake Davenport	111.3	111.8	112.1	112.9
East Lake Tohopekaliga	58.6	60.5	62.0	64.0
Lake Runnymede	58.6	60.5	62.0	64.0
Lake Russell	60.7	61.4	61.7	61.9
Lake Tohopekaliga	55.8	57.4	58.0	59.5
Lake Wilson	103.7	104.4	104.7	105.8
St. Cloud Canal	55.8	57.4	58.0	59.5
Lake Mary Jane	64.1	65.4	65.8	66.7
West City Canal; Just upstream of U.S. Highways 17 & 92	62.9	63.5	63.5	63.7

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Cross section data for Reedy Creek, Mill Slough, Boggy Creek, and Shingle Creek were obtained by field surveys. All bridges and culverts were field surveyed to obtain elevation data and structural geometry. Cross sections were located at close intervals upstream and downstream of bridges and culverts in order to compute significant backwater effects of these structures. The locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Maps (Exhibit 3).

Roughness coefficients (Manning's "n') for the computations were estimated on the basis of field inspections of flood plain areas. The roughness coefficients ranged from 0.030 for the main channel to 0.20 for the overbank areas.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Water-surface elevations of floods of the selected recurrence intervals for Reedy Creek, Mill Slough, Boggy Creek, and Shingle Creek were computed through use of the COE HEC-2 Step Backwater Computer Program (Reference 11).

Starting water-surface elevations for the streams were based on the computed water-surface elevation of the receiving stream or lake.

All elevations are measured from NGVD; elevation reference marks used in the study are shown and described on the Flood Insurance Rate Maps (Published Separately).

Flood boundaries in various locations of Osceola County, which overflow relatively undeveloped areas, were determined by approximate methods. The approximate method involved using the Osceola County Flood Hazard Boundary Maps (Reference 12), aerial photographs (flown March 7, 1979), and field investigations.

During floods, debris collecting at culverts could decrease their carrying capacity and cause greater water depths (backwater effect) upstream of the structures. However, since the occurrence and amount of debris are indeterminate factors, only the physical characteristics of the structures were considered in preparing the profiles. Flood elevations as shown on the profiles are thus considered valid only if hydraulic structures in general remain unobstructed.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale 1 inch = 2,000 feet with a contour interval of 5 feet (Reference 13), supplemented by various cross sections and a field inspection. In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For each lake flooding source studied in detail, the boundaries of the 100-year and 500-year floods have been delineated using topographic maps at a scale of 1 inch = 1,000 feet with a contour interval of 1 foot (Reference 14). In cases where the 100-year and the 500-year boundaries are close together, only the 100-year boundary has been shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Maps. Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

A floodway is generally not appropriate in areas such as those that may be inundated by floodwaters from lakes. Thus, no floodway was prepared for the area adjacent to the ten lakes.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway was computed, as shown on table 5, "Floodway Data."

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Reedy Creek								
A	3.55	5,568	23,325	0.2	58.7	58.7	59.7	1.0
B	4.73	5,455	12,337	0.4	59.7	59.7	60.6	0.9
C	5.95	2,754	14,138	0.4	61.4	61.4	62.4	1.0
D	6.74	1,513	11,487	0.4	61.7	61.7	62.7	1.0
E	8.81	1,514	10,628	0.4	63.3	63.3	64.3	1.0
F	9.45	1,384	9,590	0.4	63.9	63.9	64.9	1.0
G	9.79	712	5,325	0.7	64.3	64.3	65.3	1.0
H	10.89	1,306	9,011	0.4	65.3	65.3	66.3	1.0
I	11.98	2,471	15,454	0.2	65.7	65.7	66.7	1.0
J	13.05	2,495	14,137	0.2	66.1	66.1	67.1	1.0
K	14,07	3,192	15,140	0.2	66.4	66.4	67.4	1.0
L	15.10	5,081	24,716	0.1	66.5	66.5	67.5	1.0
M	16.12	2,918	15,285	0.2	66.7	66.7	67.7	1.0
N	16.64	2,040	8,894	0.2	66.9	66.9	67.9	1.0
O	17.17	4,644	20,654	0.1	67.0	67.0	68.0	1.0
P	18.18	4,640	19,641	0.1	67.1	67.1	68.1	1.0
Q	19.35	7,514	17,744	0.1	67.2	67.2	68.2	1.0
R	20.33	84	307	3.6	67.8	67.8	68.7	0.9

[1]Miles above mouth

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL

(UNINCORPORATED AREAS)

FLOODWAY DATA

14

REEDY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Mill Slough								
A	13,350	202	606	2.1	68.2	68.2	69.1	0.9
B	14,410	45	248	5.2	70.0	70.0	70.7	0.7
C	15,450	59	295	4.4	73.2	73.2	73.4	0.2
D	17,900	81	438	3.0	77.1	77.1	77.6	0.5
E	20,150	181	695	1.9	80.0	80.0	80.8	0.8
Boggy Creek								
A	5,600	1,020	2,900	1.8	62.0	62.0	63.0	1.0
B[2]	9,560	500	3,319	1.9	66.6	66.6	66.6	0.0
Shingle Creek								
A	5,100	2,406[3]	8,896	0.9	58.0	58.0	59.0	1.0
B	9,600	1,686	5,520	1.4	60.7	60.7	61.6	0.9
C	11,650	1,523	7,291	1.1	62.2	62.2	63.2	1.0
D	15,450	3,020	17,522	0.5	64.5	64.5	65.5	1.0
E	21,510	2,000	8,641	0.9	66.9	66.9	67.7	0.8
F	36,660	920	7,864	0.8	75.6	75.6	76.5	0.9
G	38,940	1,652	15,428	0.4	75.7	75.7	76.6	0.9
H	46,000	1,124	7,601	0.8	76.1	76.1	77.0	0.9

[1]Feet above mouth
[2]Cross section not shown on map. Lies outside county limits.
[3]Floodway not applicable within Lake Tohopekaliga flooding.

TABLE 5

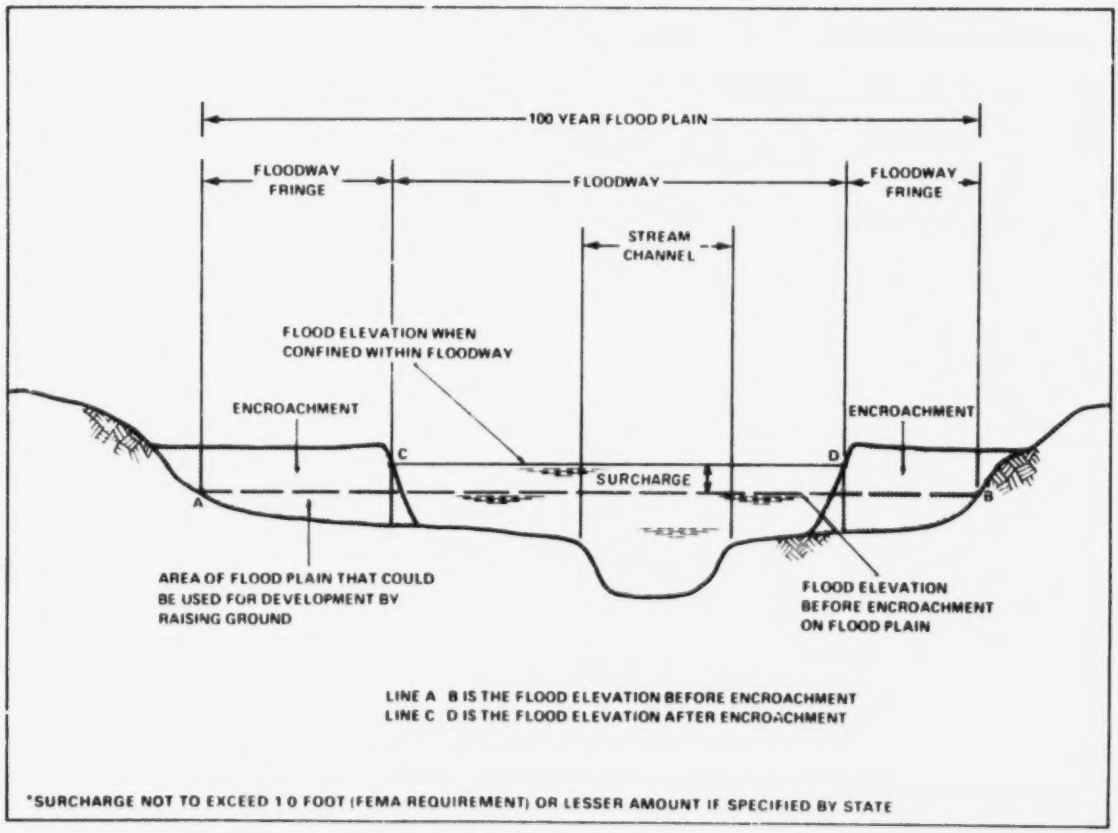
FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL

(UNINCORPORATED AREAS)

FLOODWAY DATA

15—MILL SLOUGH-BOGGY CREEK-SHINGLE CREEK


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting Osceola County.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water- does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

The locations of the reaches determined for the flooding sources of Osceola County are shown on the Flood Profiles (Exhibit 1) and summarized in Table 6, "Flood Insurance Zone Data."

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire unincorporated areas of Osceola County was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A2, A3, A4, A6, and A7:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 6, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Unincorporated areas of Osceola County is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

Flood Insurance Study for the communities of St. Cloud, Kissimmee, and Unincorporated Orange County were conducted by the Jacksonville District COE. The flood elevations determined in this study do not conflict with the flood elevations determined for those studies.

An Expanded Flood Plain Information (X-FPI) Report on the Boggy Creek basin, dated April 1979, was prepared by the Jacksonville District, COE (Reference 4). The flood stages in the X-FPI report agree with the flood stages in this report.

A Flood Plain Information Report on Shingle Creek, dated September 1974, was prepared by Reynolds, Smith, and Hills, Architects-Engineers-Planners for Orange County, Osceola County, South Florida Water Management District, and the Florida Division of State Planning (Reference 5). The flood stages, in this report agree with the flood stages in the Reynolds, Smith, and Hills report.

A Flood Hazard Information (FHI) Report on Reedy Creek, Osceola County, dated June 1976, was prepared by the Jacksonville District COE (Reference 6). The flood stages presented in this report agree with the flood stages in the FHI report.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1 0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR)	2% (50 YR)	0 2% (500 YR)			
Reedy Creek Reach 1	20,110,120, 130,140,205	-0.9	-0.4	+0.8	010	A2	Varies
Mill Slough Reach 1	30,40	-1.7	-0.6	+1.0	015	A3	Varies
Boggy Creek Reach 1	35	-3.0	-1.3	+2.0	030	A6	Varies
Shingle Creek Reach 1	20,25,30,40	-2.0	-0.6	+1.6	020	A4	Varies
West City Canal Reach 1	40	-1.2	-0.3	+0.5	010	A2	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

REEDY CREEK-MILL SLOUGH-BOGGY CREEK-SHINGLE CREEK-WEST CITY CANAL

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Lake Tohopekaliga Reach 1	40,45,130 135,140,145	-2.2	-0.6	+1.5	020	A4	58
Lake Wilson Reach 1	25	-1.0	-0.3	+1.1	010	A2	105
Lake Mary Jane Reach 1	75	-1.7	-0.4	+0.9	015	A3	66

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL

(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

LAKE TOHOPEKALIGA-LAKE WILSON-LAKE MARY JANE

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
BROWN LAKE	140	-0.9	-0.3	0.8	010	A2	65
BUCK LAKE	25	-0.9	-0.3	0.7	010	A2	105
LAKE CECILE	25	-0.8	-0.3	0.8	010	A2	77
LAKE DAVENPORT	25	-0.8	-0.3	0.8	010	A2	112
LAKE KISSIMMEE	225,300, 325,375	-1.9	-0.4	N/A	020	A4	55
EAST LAKE TOHOPEKALIGA	35,45, 75,175	-3.4	-1.5	0.2	035	A7	62
LAKE RUSSELL	140	-1.0	-0.3	0.2	010	A2	62

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT – SEE MAP

REVISED 3/16/89

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

BROWN LAKE – BUCK LAKE – LAKE CECILE – LAKE DAVENPORT – LAKE KISSIMMEE – EAST LAKE TOHOPEKALIGA – LAKE RUSSELL

A Flood Plain Information (FPI) Report on Mill Slough, Osceola and Orange Counties, dated June 1973, was prepared by the Jacksonville District COE (Reference 7). The FPI report included 100-year and Standard Project Flood Profiles for Mill Slough. The 100-year flood stages presented in this report agree with the 100-year flood stages in the FPI report.

A Detail Design Memorandum (DDM) dated June 23, 1961, on Canals 31 and 35 and Control Structures 59 and 61, was prepared by the Jacksonville District COE (Reference 8). The DDM included information on various recurrence interval floods for Lake Tohopekaliga, East Lake Tohopekaliga, and the St. Cloud Canal. The flood stages presented in this report agree with the flood stages in the DDM.

A Reconnaissance Report (Stage 1) on the Kissimmee River Basin, dated September 1979, was prepared by the Jacksonville District COE (Reference 15). The reconnaissance report describes the procedures to be used in evaluating the feasibility of modifying the existing flood control system for purposes of improving water quality and enhancing fish and wildlife resources in the Kissimmee River Basin. The study will update the hydrologic analyses conducted previously by the COE in the Kissimmee River Basin. The results of the survey review study will be used to update the Osceola County Flood Insurance Rate Maps when it is completed, scheduled for late 1982.

All areas presented on the Flood Hazard Boundary Maps (Reference 12) have been covered in this Flood Insurance Study and this new information supercedes the information on the Flood Hazard Boundary Maps.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supercede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, 1375 Peachtree Street, NE, Atlanta, Georgia 30309.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Bureau of Census, U.S. Census of Population, 1970.

2. USDA, Soil Conservation Service, Soil Survey, Osceola County Area, Florida, April 1979.

3. U.S. Army Corps of Engineers, Jacksonville District, Survey-Review Report on Central and Southern Florida Project, Boggy Creek Basin, April 25, 1961.

4. U.S. Army Corps of Engineers, Jacksonville District, Expanded Flood Plain Information, Boggy Creek, Orange, and Osceola Counties, Florida, April 1979.

5. Reynolds, Smith, and Hills, Architects-Engineers-Planners, Inventory of Existing Flooding Conditions (Flood Plain Information) Shingle Creek, September 1974.

6. U.S. Army Corps of Engineers, Jacksonville District, Flood Hazard Information, Reedy Creek, Osceola County, Florida, June 1976.

7. U.S. Army Corps of Engineers, Jacksonville District, Flood Plain Information Report, Mill Slough, Osceola and Orange Counties, Florida, June 1973.

8. U.S. Army Corps of Engineers, Jacksonville District, Central and Southern Florida Project for Flood Control and Other Purposes, Part II, Kissimmee River Basin and Related Areas, Supplement 10 - Detail Design Memorandum, Canals 31 and 35 (St. Cloud and South Port Canals) and Control Structures 59 and 61, June 23, 1961.

9. U.S. Army Corps of Engineers, Jacksonville District, Rainfall-Frequency Estimates, Orange and Seminole Counties, Florida, March 1977.

10. USDA, Soil Conservation Service, National Engineering Handbook Section 4, Hydrology, 1964, revised 1969.

11. U.S. Army Corps of Engineers Hydrologic Engineering Center, Davis, California, Generalized Computer Program HEC 2, Water Surface Profiles, November 1976.

12. U.S. Department of Housing and Urban Development, Federal Emergency Management Agency, Flood Hazard Boundary Maps, Unincorporated Osceola County, Florida, scale 1 inch = 2,000 feet, August 12, 1977.

13. U.S. Geological Survey, Quadrangle Maps, 7.5 Minute Series: Lake Hatchineha, Florida (dated 1953). The following were photo revised in 1970: Lake Louisa SW, Florida (date 1959); Intercession City, Florida (dated 1953); Kissimmee, Florida (dated 1953); St. Cloud North, Florida (dated 1953); Narcoossee, Florida (dated 1953); Davenport, Florida (dated 1953); Lake Tohopekaliga, Florida (dated 1953); St. Cloud South, Florida (dated 1953); Ashton, Florida(dated 1953); Cypress Lake, Florida (dated 1953); and Holopaw, Florida (dated 1953). The remaining were photo revised in 1972: LakeWeohyakapka NE, Florida (dated 1952); Lake Marian NW, Florida (dated 1953); Lake Marian NE, Florida (dated 1953); Lake Marian SW, Florida (dated 1953); and Lake Marian SE, Florida (dated 1953).

14. U.S. Army Corps of Engineers, Jacksonville District, Topographic Maps. Scale 1 inch = 1,000 feet, contour interval = 1 foot. Southern Resource Mapping Corp., Ormond Beach, Florida. Compiled by photogrammetric methods from aerial photography of March 7, 1979.

15. U.S. Army Corps of Engineers, Jacksonville District, Central and Southern Florida, Kissimmee River, Florida, Reconnaissance Report (Stage 1), September 1979.

9.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood hazard data located at 17 South Vernon Avenue, Kissimmee, Florida.

9.1 First Revision (Revised March 16, 1989)

a. Acknowledgments

The hydraulic analyses for this Revisions Description were obtained from the U.S. Army Corps of Engineers (COE), Jacksonville District, Florida. The Federal Emergency Management Agency reviewed and accepted these data for purposes of this revision.

b. Scope

The base flood elevation for Lake Kissimmee was defined by the COE in their report titled "Central and Southern Florida, Kissimmee River, Florida, Final Feasibility Report and Environmental Impact Statement" (Reference 16). The Special Flood Hazard Area for Lake Kissimmee was changed from Zone A to Zone A4 (Elevation 55 feet National Geodetic Vertical Datum of 1929) using the base flood elevation from the COE report and U.S. Geological Survey topographic information (Reference 17).

c. Other Studies

The Flood Insurance Study for Polk County, Florida (Reference 18) is being revised in conjunction with this revision and will be in agreement with this study.

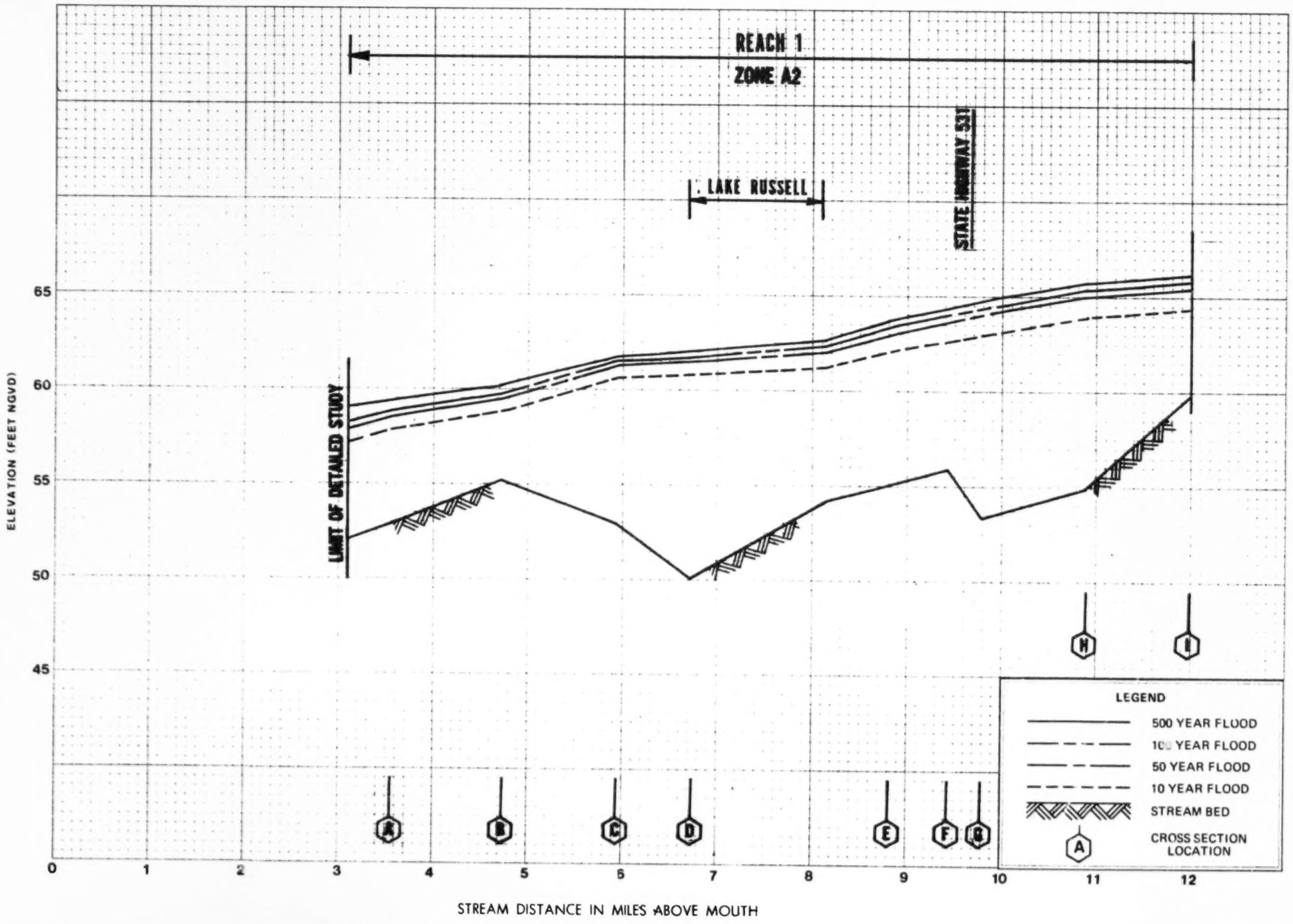
d. References and Bibliography

16. U.S. Army Corps of Engineers, Jacksonville District, Florida, Central and Southern Florida, Kissimmee River, Florida, Final Feasibility Report and Environmental Impact Statement, September 1985.

17. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 Feet: Lake Hatchineha, Florida, 1953; Lake Louisa SW, Florida, 1959, photorevised 1970; Intercession City, Florida, 1953, photorevised 1970; Kissimmee, Florida, 1953, photorevised 1970; St. Cloud North, Florida, 1953, photorevised 1970; Narcoossee, Florida, 1953, photorevised 1970; Davenport, Florida, 1953, photorevised 1970; Lake Tohopekaliga, Florida, 1953, photorevised 1970; St. Cloud South, Florida, 1953, photorevised 1970; Ashton, Florida, 1953, photorevised 1970; Cypress Lake, Florida, 1953, photorevised 1970; Holopaw,

Florida, 1953, photorevised 1970; Lake Weohyakapka NE, Florida, 1952, photorevised 1972; Lake Marian NW, Florida, 1953, photorevised 1972; Lake Marian NE, Florida, 1953, photorevised 1972; Lake Marian SW, Florida, 1953, photorevised 1972; Lake Marian SE, Florida, 1953, photorevised 1972.

18. Federal Emergency Management Agency, Flood Insurance Study, Polk County, Unincorporated Areas, Florida, January 1983, revision in progress.



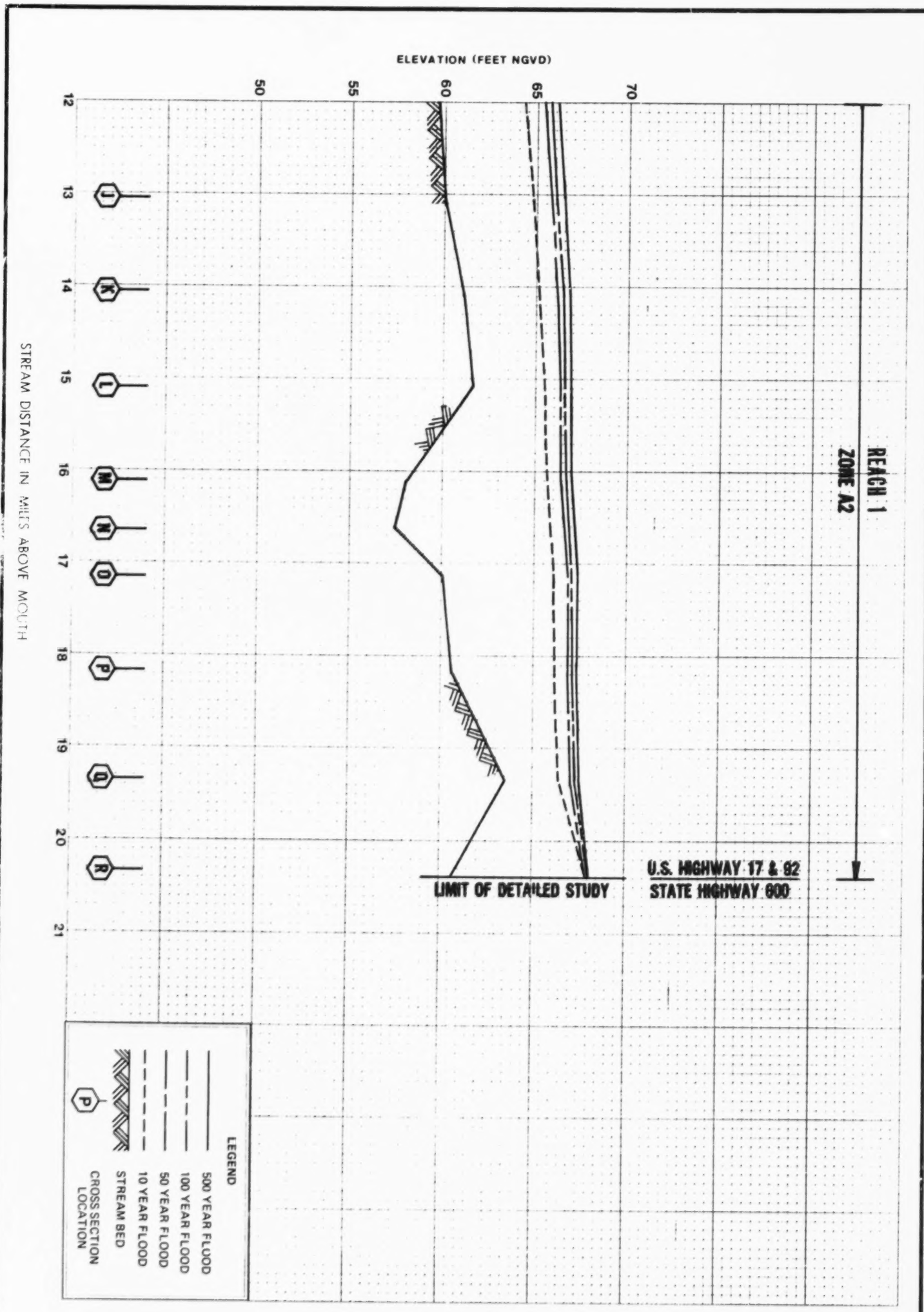
FLOOD PROFILES

REEDY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL
(UNINCORPORATED AREAS)

01P



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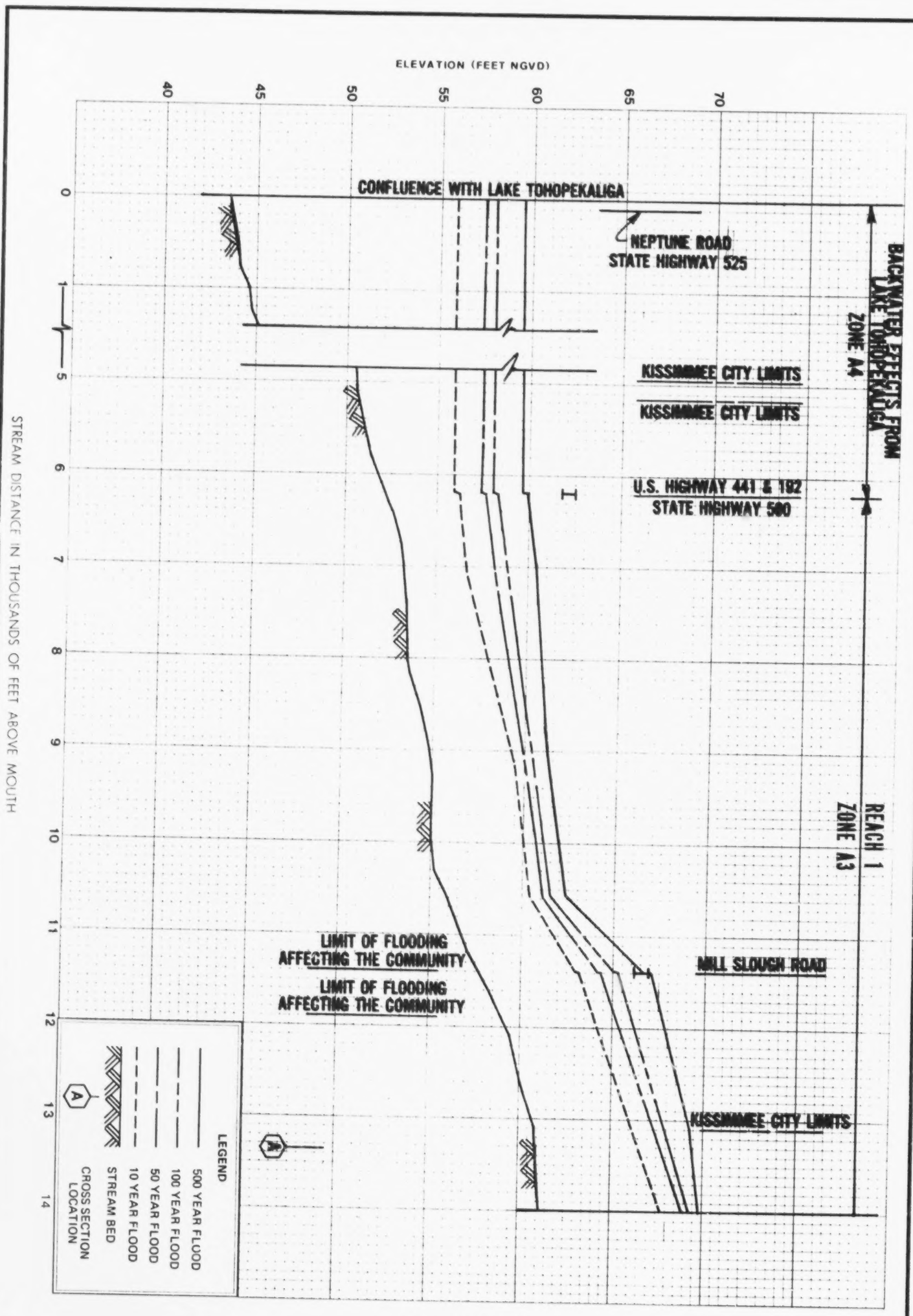

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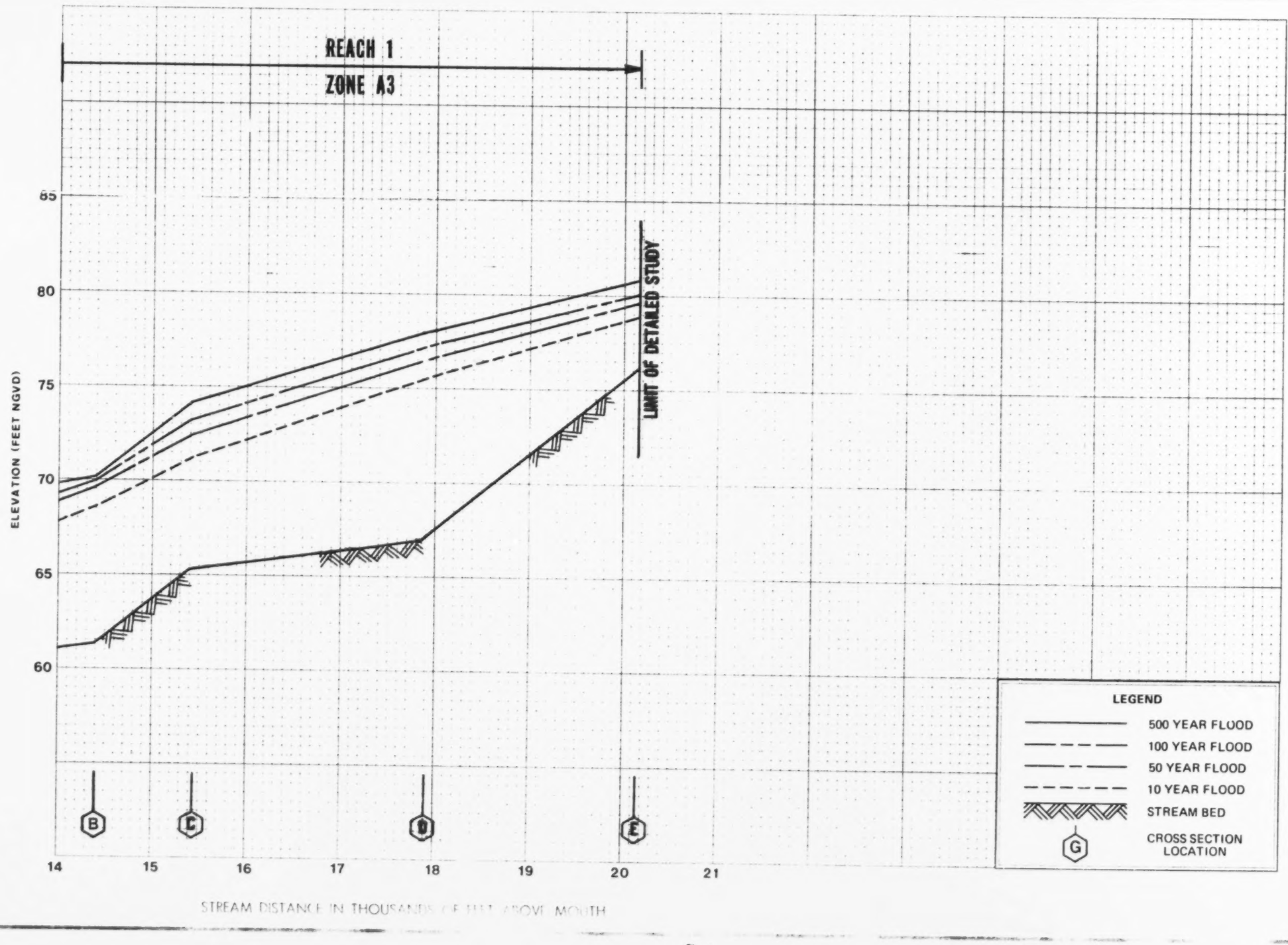
03P	FEDERAL EMERGENCY MANAGEMENT AGENCY OSCEOLA COUNTY, FL (UNINCORPORATED AREAS)	FLOOD PROFILES MILL SLOUGH



STREAM DISTANCE IN THOUSANDS OF FEET ABOVE MOUTH

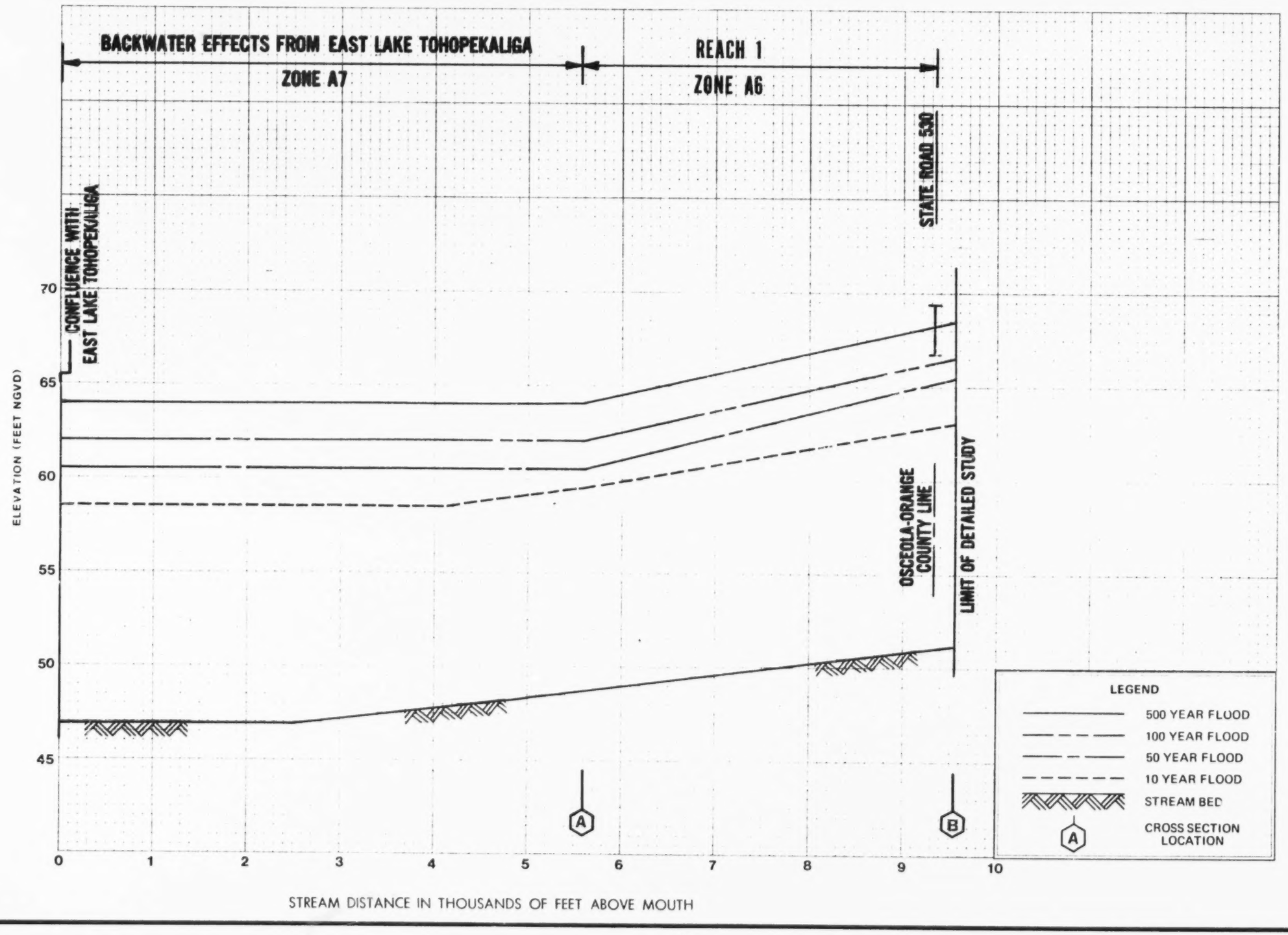
FLOOD PROFILES

MILL SLOUGH

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL
(UNINCORPORATED AREAS)

04P



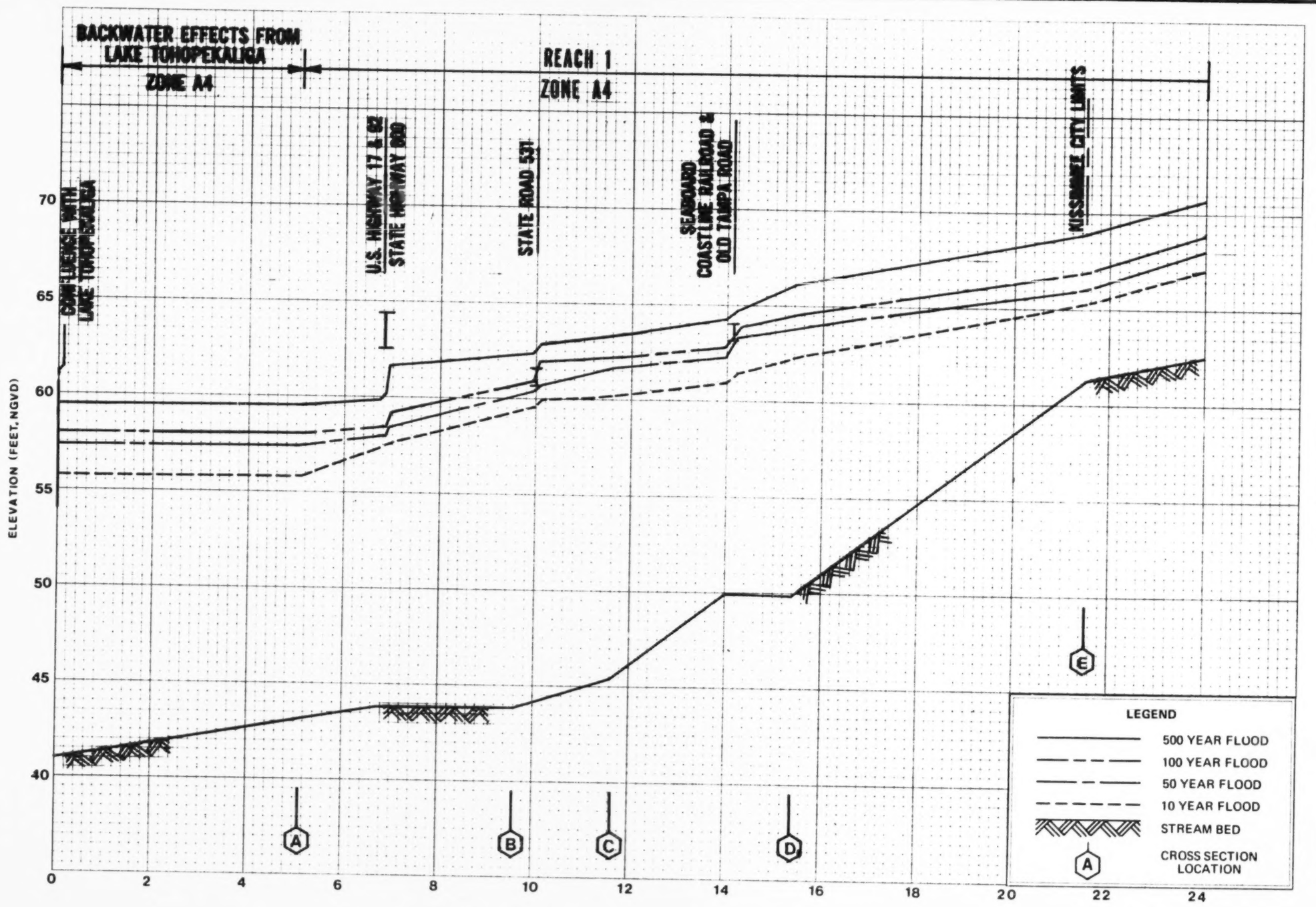
FLOOD PROFILES

BOGGY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL
(UNINCORPORATED AREAS)

05P



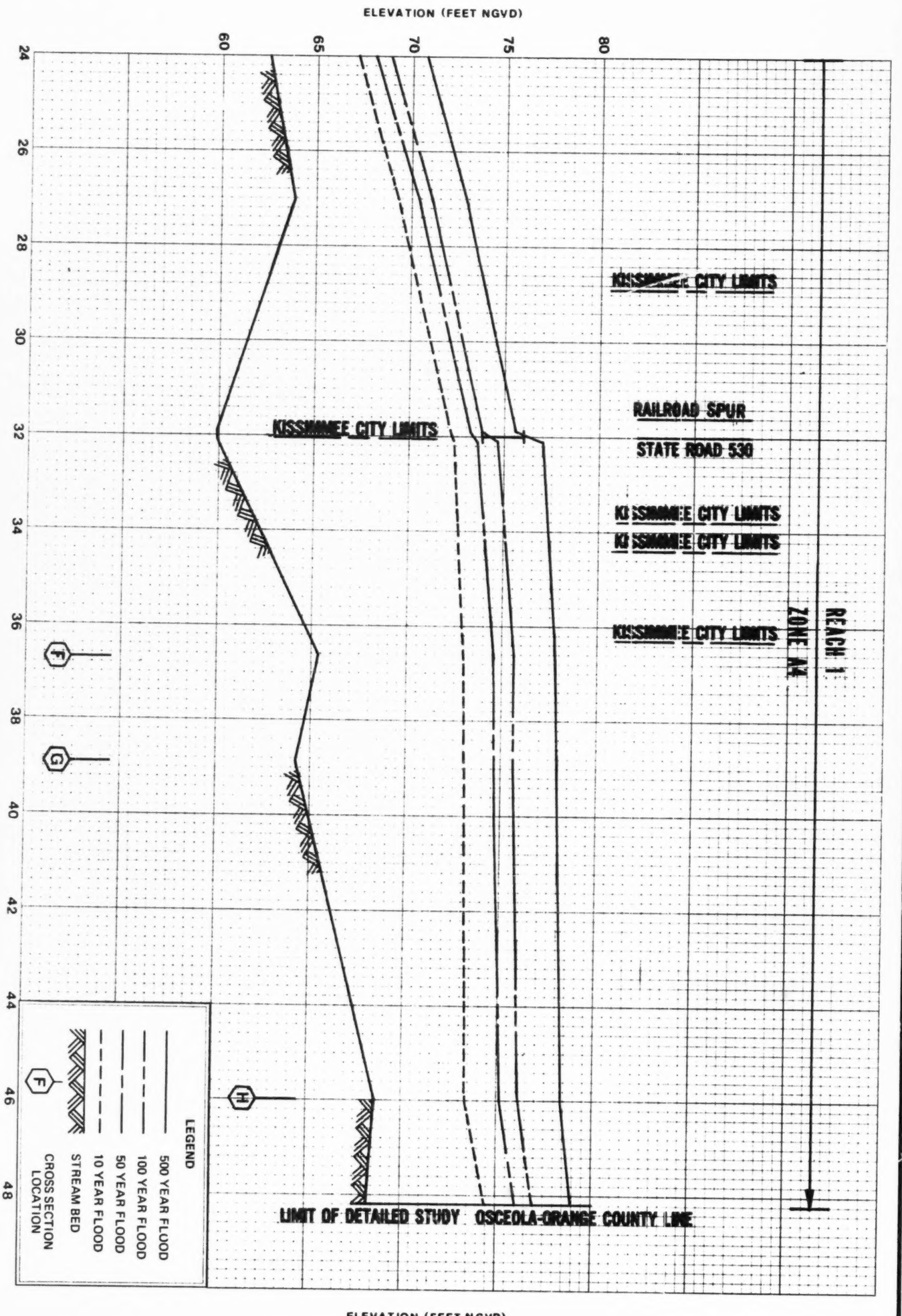
FLOOD PROFILES

SHINGLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OSCEOLA COUNTY, FL
(UNINCORPORATED AREAS)

06P



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07P	FEDERAL EMERGENCY MANAGEMENT AGENCY OSCEOLA COUNTY, FL (UNINCORPORATED AREAS)	FLOOD PROFILES SHINGLE CREEK